-THERAPEUTIC EFFECTS OF COMBINATION OF MESENCHYMAL STEM CELL AND NEURAL PRECURSOR CO-TRANSPLANTATION WITH ENRICHED ENVIRONMENT HOUSING IN A MURINE MODEL OF SPINAL CORD INJURY.

M.Boido[1], A.Niapour[2], H. Salehi [3], E. De Amicis[1], A.Vercelli [1]

[1]Neuroscience Institute of Cavalieri Ottolenghi, Neuroscience Institute of Turin, Italy; [2]Dept. of Anatomy, Ardebil University of medical sciences, Ardebil, Iran; 3Dept. of Anatomy, Isfahan University of medical sciences, Isfahan, Iran.

Stem cells have the ability to give rise to undifferentiated stem cells and to differentiate into committed mature cells, can support regeneration after an insult, show an anti-inflammatory potential and can interact with the host immune system: for all these reasons they seem good candidates in neuroregenerative medicine, since CNS has a limited capacity for self-repair after trauma or disease.

We developed an experimental model of spinal cord injury (SCI), reproducing in the mouse the damage to local neurons and to axons fibers observed in human patients. In previous experiments we demonstrated the therapeutic potential shown by mesenchymal stem cells (MSCs) and neural precursors (NPs): here we intend to test the eventual synergistic effect obtained by the combined graft of both stem cells.

We performed a spinal cord compression at vertebral T13 in adult mice and 2 weeks after SCI we injected a cell cocktail (2/3 NPs and 1/3 MSCs, for a total of 100.000 cells) directly into the lesion cavity. After the graft all the transplanted mice were housed in enriched environments in order to stimulate the locomotor activity of animals. Injured mice without graft served as controls: some of them were put in enriched cages, the others in conventional cages. In order to evaluate the functional recovery, mice underwent a battery of motor tasks. Three weeks after graft/saline, animals were sacrified and analyzed for effects of engraftment on the glial scar formation, astroglial activation, cellular and axonal damage.

Results relative to the control groups suggest that the additional physical exercise determined by enriched environment assures an improved recovery compared to normal environment: the glial cyst volume reconstructed with Neurolucida software appears smaller and the inflammation (in terms of GFAP-fluorescence intensity) appears reduced in the animals housed in enriched cages. These results correlate with the behavioural improvement shown by the motor/sensory tests.

Moreover the combination of exercise with stem cell graft further improves its therapeutic effectiveness, determining better histological results and consequently an higher recovery.

Therefore we propose that MSCs, delivering trophic and immunomodulatory molecules, can modulate the neuroinhibitory environment of the injured spinal cord and promote the integration of NPs: these positive results can be additionally enhanced by locomotor training.

Supported by Girotondo Onlus and AIM Foundations grants to AV.